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CANADA
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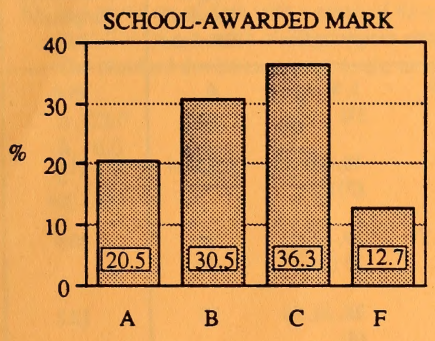
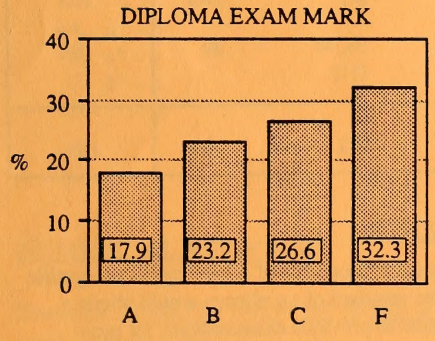
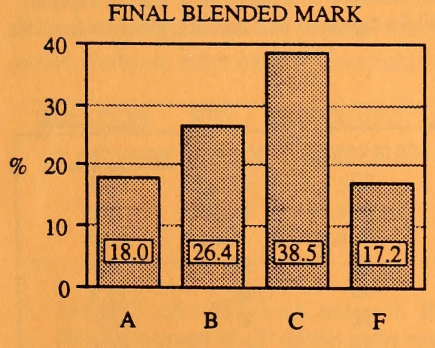
Mathematics 30 Diploma Examination Results







The summary information in this report is intended to provide teachers, school administrators, students, and the general public with an overview of results from the June 1990 administration of the Mathematics 30 Diploma Examination. The information is most helpful when used in conjunction with the detailed school and jurisdiction reports that have been mailed to schools and school jurisdiction offices. The first annual provincial report containing a detailed analysis of the combined January and June results is available this fall.

DESCRIPTION OF THE EXAM

The Mathematics 30 Diploma Examination consists of three parts: a multiple-choice section of 40 questions worth 61.5%, a numerical-response section of 12 questions worth 18.5%, and a written-response section of three questions worth 20%.

ACHIEVEMENT OF STANDARDS

The information reported is based on the final blended marks achieved by 10 098 students who wrote the June 1990 examination.

- 82.8% of these students achieved the acceptable standard (a final blended mark of 50% or higher).
- 18.0% of these students achieved the standard of excellence (a final blended mark of 80% or higher).

PROVINCIAL AVERAGES

- The average school-awarded mark was 65.5%.
- The average diploma exam mark was 60.0%.
- The average final blended mark, representing an equal weighting of the diploma and school marks, was 63.1%.

Alberta
EDUCATION

SUBTEST RESULTS

When analysing any detailed examination results, please bear in mind that subtest results **cannot** be directly compared.

Machine scored: 32.0 out of 52

Written response: 6.9 out of 13

- Course Content
  - Trigonometry: 11.0 out of 16
  - Quadratic Relations: 7.4 out of 14
  - Sequences, Series, Limits: 8.0 out of 13
  - Statistics: 5.1 out of 8
  - Logarithms: 3.4 out of 7
  - Polynomial Functions: 4.1 out of 7
- Cognitive Levels
  - Knowledge: 4.3 out of 6
  - Comprehension: 13.8 out of 20
  - Application: 17.5 out of 30
  - Higher Mental Activities: 3.4 out of 9

EXAMINATION BLUEPRINT

Each question on the examination is classified in two ways: according to the curricular content area being tested and according to the cognitive level demanded by the question. The examination blueprint illustrates the distribution of questions in June 1990 according to these classifications. Numbers with square brackets [ ] indicate written-response questions, those with round brackets ( ) indicate numerical-response questions, and those without brackets indicate multiple-choice questions.

Reporting Category	Questions by Cognitive Level				Examination Emphasis (%)
	Knowledge	Comprehension	Application	Higher Mental Activities	
Trigonometry	5	2, 3, 4, 7, 9 (1)	1, 8 [1]	6 (2)	24.6
Quadratic Relations	13	10, 11, 17 (4)	15, 16 (3) [2]	12, 14	21.5
Sequences, Series, Limits	21	18, 24, 26, 27 (7)	19, 22, 23, 25 (5)	20 (6)	20.0
Statistics	29	31 (9)	28, 32, 33 (8)	30	12.3
Logarithms	34	35	[3]	(10)	10.8
Polynomial Functions	37	39 (12)	36, 40 (11)	38	10.8
Examination Emphasis (%)	9.2	30.8	46.2	13.8	100

RESULTS and EXAMINERS' COMMENTS

The examination has a balance of question types and difficulties and is designed so that a student capable of achieving the acceptable standard would obtain a mark of 50% or better on the examination. Students achieving the standard of excellence would obtain a mark of 80% or better on the examination. Despite the parallel structure of this examination to previous examinations, far more students than expected (32.3%) failed to achieve the acceptable level. Future examinations will require students to demonstrate clarity in their thinking as well as a higher level of thinking on a broader range of goals. Students will need to achieve these learner expectations if they are to be successful on the examination. For information concerning the 1990-91 diploma examinations, please consult the 1990-91 Mathematics and Sciences bulletin.

MULTIPLE CHOICE

QUESTION	KEY	DIFFICULTY*	QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY
1	B	92.1	14	A	33.4	27	C	65.4
2	A	85.1	15	B	73.5	28	C	83.6
3	C	53.2	16	D	48.2	29	A	72.9
4	D	69.8	17	A	70.4	30	D	43.5
5	A	62.8	18	B	65.7	31	B	71.8
6	C	46.2	19	C	69.7	32	B	59.4
7	D	77.0	20	D	45.7	33	C	64.1
8	B	51.6	21	C	71.5	34	A	78.5
9	D	82.1	22	B	55.6	35	C	70.3
10	A	62.7	23	A	75.5	36	D	66.1
11	C	65.0	24	C	68.0	37	B	70.3
12	A	60.8	25	D	53.6	38	B	41.6
13	D	69.0	26	B	87.5	39	A	73.7
						40	D	60.7

*Difficulty – percentage of students answering the question correctly

MULTIPLE CHOICE (continued)

All students were expected to answer correctly most knowledge and comprehension questions – those questions that required students to apply one concept. Close to 25% of the students did not meet this expectation. Students achieving the standard of excellence were expected to demonstrate a thorough knowledge of mathematics and to apply this knowledge to new situations. Questions 6, 12, 14, 20, 30, and 38 required students to generalize their knowledge of a mathematical concept. Detailed comments on questions 30 and 34, which illustrate the varying question types and difficulty levels included in the examination, follow.

30. In a given set of data with a mean of $4x + 6$ and a standard deviation of x, a mark of 30 produces a z-score of $x - 2$. The standard deviation correct to the nearest tenth is

A. 22.0
B. 6.0
C. 5.1
*D. 4.0

Question 30 required students to solve for the standard deviation, x. Students had to substitute three functions of x into the z-score definition, solve the resulting quadratic equation, and select the one meaningful root, $x = 4$. Had the question involved the substitution of three numbers instead of three functions, many more students would have answered correctly. Nearly three-quarters of the students whose examination marks were over 80% obtained the correct answer. Most of the students whose examination marks were below 50% appeared to confuse standard deviation and mean, or they made arithmetic errors: fewer than one-quarter of them obtained the correct answer.

34. If $\log_a (x + b) = c$, then x in terms of a, b, and c is

*A. $a^c - b$
B. $c^a - b$
C. $b^c - a$
D. $c^b - a$

The results for question 34 are in marked contrast to the results for written-response question 3. Three-quarters of the students eliminated the single logarithm in this question and then solved for x, yet very few students could remove the three logarithms used in written-response question 3. Over half the students whose examination marks were below 50% answered this question correctly. A small percentage of students appeared to confuse the base with the exponent when moving from logarithmic to exponential form.

NUMERICAL RESPONSE

Students should be reminded to check their answer sheet against their work to ensure that they have correctly filled in the answer sheet.

Based on initial field-test results, the numerical-response average score of 48.6% was approximately the score students were expected to achieve.

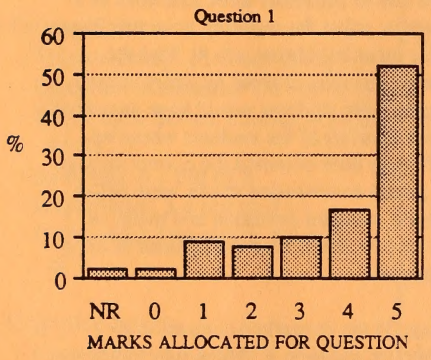
QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY	QUESTION	KEY	DIFFICULTY
1	010.3	84.6	5	002.5	79.3	9	002.8	72.3
2	111.3	18.5	6	000.8	07.0	10	012.8	45.6
3	002.0	41.4	7	000.3	53.4	11	005.3	41.6
4	003.9	49.8	8	043.8	37.7	12	012.0	51.7

2. In ΔABC, $\angle B = 53°$, $b = 6$, and $c = 7$. If $\angle C$ is obtuse, then the measure of $\angle C$ correct to the nearest tenth of a degree is _____.

Question 2 required students to use the Sine Law to find the value of sin $\angle$C, to recognize that $\angle$C could be two possible angle measures, and then to choose the obtuse angle. Only one-fifth of the students obtained the correct answer. Over half the students failed to recognize that there were two possible angle measures for $\angle$C and identified only the acute angle shown on their calculators.

WRITTEN RESPONSE

Questions in the written-response section dealt with three of the six content strands for Mathematics 30. Students performing at the acceptable standard were expected to answer question 1 well, to obtain at least half marks on question 2, and to be challenged by question 3. Students performing at the standard of excellence were expected to answer all questions almost perfectly. Based on initial field-test results, the written-response average score of 53.3% was approximately 5% lower than was expected.

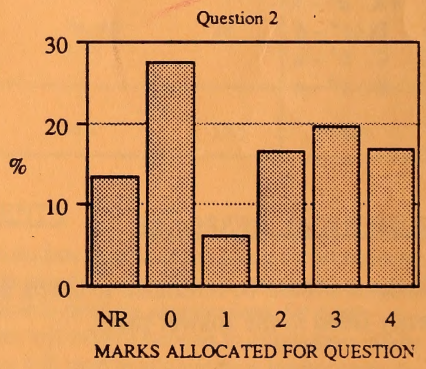


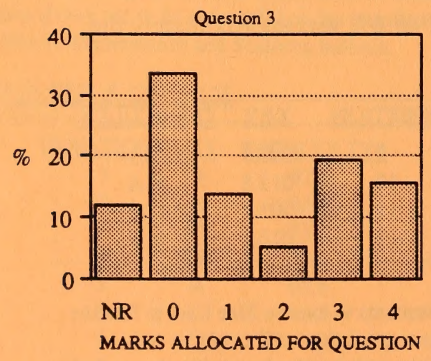
Question 1 was answered extremely well by most students. Students were required to draw a diagram, to compute the perimeter of the triangle, and then to identify the largest angle in the triangle. Markers noticed that many students did not substantiate their answers. Students should be reminded to show **all** their calculations and explanations for the written-response section. On this 5-mark question, the average mark was 3.81 for 76.2% of the available mark.

Question 2 required students to identify the distance between the origin and a vertex, to identify the distance between the origin and a focus, to calculate one-half the length of the conjugate axis, and then to identify the equations for the asymptotes of the hyperbola. Only half the students performing at the standard of excellence were able to find the equations of the asymptotes. Students did not earn full marks if they did not provide complete equations; that is, if their equations were not in one of the following forms:

$$y = \pm mx; \quad x = \pm\frac{1}{m}y; \quad \text{or} \quad mx \pm y = 0.$$

On this 4-mark question, the average mark was 1.65 for 41.3% of the available mark.





Question 3 required students to solve a logarithmic equation and to recognize that they must check the solutions of the quadratic equation. Approximately one-third of the students incorrectly assumed that "a + b = c" follows from "log(a) + log(b) = log(c)." Close to one-fifth of the students solved the resulting quadratic equation, but they failed to recognize that the logarithm of a negative number is undefined and that only one solution satisfied the original equation. On this 4-mark question, the average mark was 1.46 for 36.5% of the available mark.

Note: Markers are increasingly concerned about the incorrect use of "=" symbols. Given this concern, they will be checking for the accuracy of students' mathematical statements in future examinations. Students must continue to be informed of the importance of explaining their work fully in the written-response section of the examination. In several instances, students could have received additional marks if markers had been able to determine how students had obtained an answer.

For further information, contact Phill Campbell or Florence Glanfield at the Student Evaluation Branch, 427-2948.